IN THE CLAIMS

Please amend the claims as follows:

1-18. (Cancel)

19. (New) A receiver comprising:

an orthogonal demodulator using an input signal, a first local oscillation signal, a second local oscillation signal, a first reference signal, and a second reference signal, the orthogonal demodulator comprising a first frequency converter, a second frequency converter, and a phase shifter;

the first frequency converter including:

a first variable gain amplifier which amplifies the first local oscillation signal according to a first gain control signal, and outputs an amplified first local oscillation signal;

a first even harmonic mixer which is supplied with the input signal and the amplified first local oscillation signal and outputs an output signal whose frequency corresponds to a difference between a frequency of the input signal and a frequency of two or more even numbered times a frequency of the amplified first local oscillation signal;

a first amplitude detector which is supplied with the amplified first local oscillation signal and outputs a first direct current signal having an amplitude corresponding to an amplitude of the amplified first local oscillation signal; and

a first comparator which compares the first reference direct current signal with the first direct current signal to generate an output signal as the first gain control signal;

the second frequency converter including:

a second variable gain amplifier which amplifies the second local oscillation signal according to a second gain control signal, and outputs an amplified second local oscillation signal;

a second even harmonic mixer which is supplied with the input signal and the amplified second local oscillation signal and outputs an output signal whose frequency corresponds to a difference between a frequency of the input signal and a frequency of two or more even numbered times a frequency of the amplified second local oscillation signal;

a second amplitude detector which is supplied with the amplified second local oscillation signal and outputs a second direct current signal having an amplitude corresponding to an amplitude of the amplified second local oscillation signal; and

a second comparator which compares the second reference direct current signal with the second direct current signal to generate an output signal as the second gain control signal; and

the phase shifter outputting the first local oscillation signal and the second local oscillation signal with a given phase difference therebetween to the first frequency converter and the second frequency converter;

a received signal state detector configured to detect a received signal state and output a detection signal; and

a controller supplied with the detection signal and configured to output a control signal used for setting a conversion gain and an operation state to the first frequency converter and the second frequency converter.

20. (New) The receiver according to claim 19, wherein the phase difference is 90°/n, when the frequency of the input signal is n times the frequency of the first local oscillation signal and the second local oscillation signal, where n is two or more even number.

21. (New) The receiver according to claim 19, which further comprises first and second low pass filters and wherein the received signal state detector comprises first and second received signal state detector units configured to detect powers of signals input to the first and second low pass filters, respectively, and the controller comprises first and second controller units configured to control the first frequency converter and the second frequency converter on bias states, respectively, according to detected results of the first and second received signal state detector units.

22. (New) A receiver comprising:

an orthogonal modulator using an input signal, a first local oscillation signal, a second local oscillation signal, a first reference signal, and a second reference signal, the orthogonal

demodulator comprising a first frequency converter, a second frequency converter, and a phase shifter:

the first frequency converter including:

a first variable gain amplifier which amplifies the first local oscillation signal according to a first gain control signal, and outputs an amplified first local oscillation signal;

a first even harmonic mixer which is supplied with the I signal of baseband and the amplified first local oscillation signal and outputs an output signal whose frequency corresponds to a sum of a frequency of the input signal and a frequency of two or more even numbered times a frequency of the amplified first local oscillation signal;

a first amplitude detector which is supplied with the amplified first local oscillation signal and outputs a first direct current signal having an amplitude corresponding to an amplitude of the amplified first local oscillation signal; and

a first comparator which compares the first reference direct current signal with the first direct current signal to generate an output signal as the first gain control signal;

the second frequency converter including:

a second variable gain amplifier which amplifies the second local oscillation signal according to a second gain control signal, and outputs an amplified second local oscillation signal;

a second even harmonic mixer which is supplied with the Q signal of baseband and the amplified second local oscillation signal and outputs an output signal whose frequency corresponds to a sum of a frequency of the Q signal and a frequency of two or more even numbered times a frequency of the amplified second local oscillation signal;

a second amplitude detector which is supplied with the amplified second local oscillation signal and outputs a first direct current signal having an amplitude corresponding to an amplitude of the amplified first local oscillation signal; and

a second comparator which compares the second reference direct current signal with the second direct current signal to generate an output signal as the second gain control signal; and

the phase shifter outputting the first local oscillation signal and the second local oscillation signal with a given phase difference therebetween to the first frequency converter and the second frequency converter;

a received signal state detector configured to detect a received signal state and output a detection signal; and

a controller supplied with the detection signal and configured to output a control signal used for setting a conversion gain and an operation state to the first frequency converter and the second frequency converter.

23. (New) An orthogonal demodulator according to claim 22, wherein the phase difference is 90°/n, when the frequency of the input signal is n times the frequency of the first local oscillation signal and the second local oscillation signal, where n is two or more even number.

24. (New) The receiver according to claim 22, which further comprises first and second low pass filters and wherein the received signal state detector comprises first and second received signal state detector units configured to detect powers of signals input to the first and second low pass filters, respectively, and the controller comprises first and second controller units configured to control the first frequency converter and the second frequency converter on bias states, respectively, according to detected results of the first and second received signal state detector units.